APPARATUS AND METHODS FOR REMOVING RESIDUAL STAIN

FIELD

[0001] The present invention relates generally to staining processes and more particularly (but not exclusively) to apparatus and methods for removing residual stain from a surface.

BACKGROUND

[0002] Traditional staining processes involve applying (e.g., spraying, wiping, brushing, rolling, etc.) stain onto a surface, and then relatively immediately thereafter wiping off the excess residual stain with a rag or cloth. A common problem with traditional staining processes, however, is that using a rag or cloth to wipe off residual stain from less accessible areas, such as grooves, cracks, and joints, is oftentimes both difficult and time consuming.

SUMMARY

[0003] In one embodiment, the present invention provides an apparatus for removing residual stain from a surface to which a stain has been applied. The apparatus includes an inlet chamber connected to a nozzle, and an outlet chamber adapted for connection to a source of low pressure to establish a flow through the apparatus, into the inlet chamber and out the outlet chamber. The apparatus further includes a reservoir for trapping stain entrained in the flow through the apparatus.

[0004] In another embodiment, the present invention provides a method of removing residual stain from a surface to which a stain has been applied that generally includes suctioning residual stain from the surface.

[0005] In another embodiment, the present invention provides a method of staining a surface that generally includes applying stain to the surface; suctioning residual stain from the surface; and collecting the residual stain suctioned from the surface in a reservoir.

[0006] Some embodiments can further include recycling and reapplying at least a portion of the stain collected in the reservoir to a surface, for example, by using a flow from the suctioning to provide operating pressure for an air brush or other suitable stain applicator.

[0007] Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples below, while indicating exemplary embodiments of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The present invention will be more fully understood from the detailed description and the accompanying drawings, wherein:

[0009] FIG. 1 is a schematic view of an apparatus according to one embodiment of the invention;

[0010] FIG. 2 is a partial side cross-sectional view of the apparatus shown in FIG. 1;

[0011] FIG. 3 is a schematic view of an apparatus according to another embodiment of the invention; and

[0012] FIG. 4 is a partial side cross-sectional view of the apparatus shown in FIG. 3.

[0013] Corresponding reference numerals indicate corresponding parts throughout the several views of the drawings.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0014] According to one aspect of the invention, a method of removing residual stain from a surface to which a stain has been applied generally includes suctioning residual stain from the surface. Another aspect of the invention provides a method of staining a surface that generally includes applying stain to the surface; suctioning residual stain from the surface; and collecting the residual stain suctioned from the surface in a reservoir.

[0015] Accordingly, certain embodiments of the invention allow for efficient residual stain removal in less time and with reduced labor costs as compared to traditional staining methods in which a rag or cloth is used to wipe off residual stain. Indeed, these embodiments can be especially advantageous for less accessible areas, such as grooves, cracks, joints, etc., from which removing residual stain with a rag or cloth is oftentimes difficult and time consuming.

[0016] As used herein, the term "stain" includes, but is not limited to, a wide range of generally liquid substances that are applied to a surface (e.g., wood surfaces, etc.) to impart a color to the surface and/or to protect the surface, for example, from environmental and weather conditions. Indeed, it is anticipated that embodiments of the invention will be applicable to a wide range of stains, coating materials, and protecting agents such as water sealants, wood protectants, combustible liquid stains, noncombustible liquid stains, water-soluble stains, acrylic stains, oil-soluble stains, oil-based stains, alcohol-soluble stains, among others. Accordingly, the specific references to stain herein should not be construed as limiting the scope of the present invention to a specific form/type of stain.

[0017] FIGS. 1 and 2 illustrate an exemplary apparatus 100 embodying several aspects of the invention. As shown in FIGS. 1 and 2, the apparatus 100 includes an inlet chamber 102 and an outlet chamber 104. The inlet chamber 102 is connected to a nozzle, which in the illustrated embodiment includes at least one hose 106 and at least one tip 108 as described below.

[0018] The outlet chamber 104 is adapted for connection to a source of low pressure 110. The source 110 has a pressure lower than the pressure within the

outlet chamber 104 such that connection of the outlet chamber 104 to the source 110 establishes a flow (indicated by arrows 112, in FIG. 2) through the apparatus 100, into the inlet chamber 102 and out the outlet chamber 104.

[0019] In the illustrated embodiment, the apparatus 100 includes a housing 114, which at least partially defines the inlet and outlet chambers 102 and 104. The housing 114 can be formed from a wide range of materials. Preferably, a lightweight material which is non-reactive to the stains being suctioned, such as polypropylene, is used for the housing 114.

[0020] The apparatus 100 also includes a container or reservoir 116 for trapping stain entrained in the flow through the apparatus 100. In some embodiments, the stain collected within the reservoir 116 is recycled, although the collected stain can also be discarded.

[0021] The reservoir 116 can be variously sized and be formed from a wide range of materials, preferably lightweight, non-reactive to the stains being suctioned, and transparent (or at least translucent) to allow for the amount of stain within the reservoir 116 to be readily determined. In an exemplary embodiment, the reservoir 116 is formed of polycarbonate material and has a holding capacity of nineteen fluid ounces of stain, although other materials and sizes can be employed.

[0022] To allow the reservoir 116 to be emptied (e.g., dumped out), the reservoir 116 can include a removable portion engaged with the housing 114 using a suitable fastening system or method (e.g., a threaded connection, an interference fit, resilient ribs, among others). As shown in FIG. 2, the reservoir 116 includes a threaded portion 118 adapted to threadedly engage a correspondingly threaded portion 120 of the housing 114. Preferably, a fluidic sealing member 122 (e.g., a resilient o-ring) is positioned on a shoulder 124 within the reservoir 116 to create a fluid-tight seal for the threaded interface between the reservoir 116 and the housing 114.

[0023] In this exemplary manner, the reservoir 116 can be removed from the housing 114 by rotating the reservoir 116 relative to the housing 114 to unthread the reservoir 116 from the housing 114. The reservoir 116 can then be reattached to

the housing 114 by counter-rotating the reservoir 116 relative to the housing 114 to thread the reservoir 116 back onto the housing 114.

[0024] The reservoir 116 can also be provided with a drain 126. When the drain is opened, at least some of the stain flows out of the reservoir 116 through the drain 126. By way of example only, the drain 126 may include a brass 0.125-inch drain cock installed in a sidewall 128 of the reservoir 116 adjacent the bottom 130 of the reservoir 116. Alternatively, other drain types and sizes and other locations for the drain can be employed.

[0025] It should be noted that the drain 126 can be in addition to or an alternative to the reservoir 116 being removable. For example, one embodiment includes a reservoir having a drain with the reservoir being an integral part of and not removable from the housing. In another embodiment, the reservoir is removably coupled to the housing but does not include a drain.

[0026] With further reference to FIGS. 1 and 2, the apparatus 100 includes a filter 132 positioned to filter and capture particulates from the flow 112 through the apparatus 100 before the flow 112 exits the outlet chamber 104. In this manner, the particulates (e.g., saw dust, etc.) suctioned into the apparatus 100 are prevented from entering and possibly clogging or damaging the low pressure source 110. The filter 132 is also positioned such that the particulates captured thereby are prevented from exiting through the drain 126. This, in turn, allows the collected stain to be readily separated from the particulates when the stain is removed from the reservoir 116 via the drain 126. In one embodiment, the filter 132 includes a 40-mesh strainer screen, although other filter types and sizes (e.g., 10-mesh, 80-mesh, etc.) can also be employed.

[0027] In the illustrated embodiment, the source of low pressure 110 used to establish the flow through the apparatus 100 includes a vacuum generator 134. The vacuum generator 134 preferably enables the apparatus 100 to operate at a flow rate between about one cubic foot per minute and three cubic feet per minute. However, other embodiments can include operating the apparatus 200 at different flow rates suitable for other applications including industrial or commercial

applications, small business applications, personal or residential applications, and/or multi-line applications. For example, one exemplary multi-line application includes a plurality of hoses in communication with a common reservoir in which is collected the stain entrained in the flows suctioned through the hoses.

[0028] An exemplary vacuum generator which can be used to establish the flow through the apparatus 100 includes a Gast® Model VG-020-00-00 vacuum generator, which is currently available from the Gast Manufacturing, Inc. of Benton Harbor, Michigan. Alternatively, other sources of low pressure can also be employed. For example, FIG. 3 illustrates another embodiment 200 in which a rotary vane pump 234 is used as a source of low pressure or suction, as described below.

[0029] As shown in FIG. 1 and 2, the vacuum generator 134 can be connected to the outlet chamber 104 in any manner that creates a fluid-tight connection. Examples of the many possible connections include a bushing 136 (e.g., a polypropylene 1.50-inch by 0.75-inch bushing, etc.) threadedly engaged with both a threaded portion 138 of the housing 114 and with another bushing 140 (e.g., a brass 0.75-inch by 0.375-inch bushing, etc.). The opposed ends of a nipple 142 (e.g., a brass 0.375-inch close nipple, etc.) are threadedly engaged respectively with the bushing 140 and the vacuum generator 134. In this exemplary manner, the vacuum generator 134 can be connected to the outlet chamber 104.

[0030] The vacuum generator 134 is adapted for connection to a source of air, such as an air compressor or pump (not shown). In the illustrated embodiment, one end of an elbow 144 (e.g., a brass 0.125-inch NPT (National Pipe Thread) male by female ninety degree elbow, etc.) is threadedly engaged with the vacuum generator 134. The other end of the elbow 144 is threadedly engaged with an end of a valve 146 (e.g., a chrome plated brass ball valve with 0.125-inch male by female fittings, etc.). The other end of the valve 146 is threadedly engaged with a pneumatic hose coupling 148 (e.g., a galvanized steel industrial pneumatic hose coupling 0.125-inch male threaded, etc.). The pneumatic hose coupling 148 is adapted for connection with a line from an air compressor or pump. In this exemplary manner, the vacuum generator 134 can be connected to an air compressor or pump.

[0031] Within the vacuum generator 134 is a venturi nozzle (not shown) having an inlet and an outlet for establishing a flow through the venturi nozzle. The venturi nozzle receives air into its inlet from the air compressor or pump connected to the vacuum generator 134 as described above. As air travels through the venturi nozzle, the velocity of the air increases and the pressure within the venturi nozzle decreases. This pressure decrease causes fluid (e.g., air, vapors, etc.) to be drawn or pulled out of the outlet chamber 104 into the vacuum generator 134.

[0032] Preferably, the apparatus 100 is configured such that the flow out of the outlet chamber 104 and through the vacuum generator 134 is isolated from and does not flow through a motor or electric windings of the air compressor or pump connected to and providing air to the vacuum generator 134. This facilitates compliance with Article 501-8b provisions defined by the National Electric Code (NEC) for potentially Class I, Division 2, environments.

[0033] As shown in FIG. 1, the apparatus 100 can further include a muffler or sound attenuator 150. The muffler 150 is in communication with the outlet of the vacuum generator 134. During operation of the apparatus 100, the muffler 150 receives exhaust from the vacuum generator 134, which includes fluid (e.g., air, vapors, etc.) drawn out of the outlet chamber 104 and air provided by the compressor or pump.

[0034] In some embodiments, the apparatus 100 can also include a filter (not shown) for removing various harmful and/or volatile vapors before they are exhausted to atmosphere. By way of example, a filter can be positioned to receive exhaust from the muffler and be adapted to remove or filter certain harmful and/or volatile vapors before they are exhausted to the surrounding atmosphere.

[0035] In FIG. 1, the nozzle connected to the inlet chamber 102 includes a hose 106 having an end portion 152 removably coupled to the inlet chamber 102, for example, to allow for ready installation and/or removal of the hose 106. Coupling the hose end portion 152 to the inlet chamber 102 connects the hose 106 with the inlet chamber 102. Accordingly, low pressure within the inlet chamber 102 creates suction with the hose 106 in a direction towards the inlet chamber 102. Although

FIG. 1 shows the apparatus 100 including a single hose 106, other embodiments can include a plurality of hoses in communication with a common reservoir in which is collected the stain entrained in the flows suctioned through the hoses.

[0036] As shown in FIGS. 1 and 2, the hose 106 can be connected to the inlet chamber 102 as follows. A bushing 154 (e.g., a polypropylene 1.5-inch by 0.75-inch bushing, etc.) is threadedly engaged both with a threaded portion 156 of the housing 114 and another bushing 158 (e.g., a brass 0.75-inch by 0.25-inch bushing, etc.). The bushing 158 is internally threaded and is threadedly engaged with a fitting 160 (e.g., 0.25-inch male threaded swivel fitting, etc.) coupled to the hose end portion 152. In this exemplary manner, the hose 106 can be connected to the inlet chamber 102.

[0037] The hose 106 can be formed from a wide range of materials, which are preferably lightweight, flexible and non-reactive to the stains being suctioned. In one embodiment, the hose 106 includes coiled polyurethane tubing.

[0038] The hose 106 can be provided in any suitable size (e.g., length, inner and outer diameter, etc.), which may depend at least in part on requirements (e.g., flow rates, etc.) of the particular application in which the apparatus 100 will be used. In one embodiment, the hose 106 includes a 0.25-inch inner diameter and is twenty feet in length, although other suitable materials and hose sizes can be employed.

[0039] A tip or nozzle 108 may be disposed at the hose end portion 162. A wide range of materials and sizes can be used for the tip 108 depending, at least in part, on the particular application in which the apparatus 100 will be used. In an exemplary embodiment, the tip 108 is formed from polyethylene and includes an 0.375-inch outer diameter at its end portion 164, although other suitable sizes and materials, preferably materials non-reactive to the stains being suctioned, can be employed.

[0040] The tip 108 can be removably coupled to the hose end portion 162, for example, to allow for ready installation and/or removal. In FIG. 1, the tip 108 is removably coupled to the hose end portion 162 as follows. The hose end portion 162

includes a fitting 166 (e.g., a 0.25-inch male threaded swivel fitting, etc.) threadedly engaged with a coupling 168 (e.g., a galvanized steel 0.25-inch coupling, etc.). The coupling 168 is coupled to a tube fitting or connector 170, such as a Parker Prestolok brass push-in tube fitting having a 0.25-inch male threaded portion and a 0.375-inch inner diameter. In this exemplary manner, the tip 108 can be readily installed and/or removed from the hose 106 via the tube fitting 170.

[0041] Certain embodiments include a plurality of interchangeable tips 108, 108', and 108", each of which is adapted to be received within and thus removably coupled to the tube fitting 170 at the hose end portion 162. The tips 108, 108', and 108" can have a variety of sizes and configurations, to adapt or customize the apparatus 100 for removing residual stain from a particular surface type or feature (e.g., generally flat surface, groove, ridge, crack, joint, etc.). By selecting and installing the tip having the most suitable size and configuration for the particular surface type or feature from which residual stain is to be removed, the operator can even further improve the efficiency at which residual stain is removed by the apparatus 100.

[0042] In the illustrated embodiment, the apparatus 100 includes tip holders or carriers 172, 172', and 172" each adapted to receive one of the tips 108, 108', and 108". Although a wide range of materials can be used, the tip holders 172, 172', and 172" are preferably made from a resilient material, such as a flexible polymer or thermal plastic material. Each tip holder 172, 172', and 172" is preferably sized to frictionally engage a tip inserted therein. Accordingly, the tip holders 172, 172', and 172" provide a convenient way to store the tips which are not being used.

OPERATION

[0043] In operation, the apparatus 100 shown in FIGS. 1 and 2 can be used as follows. The tip 108, 108' or 108" most suitable for removing residual stain from the particular surface feature or type is selected and installed in the tube fitting 170 at the hose end portion 162. To install the selected tip, the existing tip, if there is

one, must first be removed from the tube fitting 170. The removed tip can be stored within one of the tip holders 172, 172', or 172".

[0044] If not already so connected, the line from an air compressor or pump is connected to the pneumatic hose coupling 148. Next, the valve 146 is moved into its open position which allows the air compressor or pump to provide air to the venturi nozzle inlet within the vacuum generator 134.

[0045] As air flows through the venturi nozzle within the vacuum generator 134, the velocity of the air increases and pressure within the venturi nozzle decreases. This pressure decrease causes fluid (e.g., air, vapors, etc.) to be drawn or pulled out of the outlet chamber 104 and into the vacuum generator 134, thus establishing a flow through the apparatus 100.

[0046] Drawing of fluid out of the outlet chamber 104 by the lower pressure (i.e., an area having a lower pressure than the pressure within the outlet chamber) within the vacuum generator 134 establishes a flow through the apparatus 100 and creates suction within the hose 106 in a direction from the tip 108 towards the inlet chamber 102.

[0047] The inlet 174 of the tip 108 is positioned proximate residual stain to be removed. The suction within the hose 106 causes the residual stain to be pulled into the tip inlet 174 and to flow through the hose 106. The flow including the stain entrained therein is discharged from the hose 106 into the inlet chamber 102.

[0048] As the flow 112 (FIG. 2) travels from the inlet chamber 102 to the outlet chamber 104, stain entrained in the flow is collected in the reservoir 116. Particulates within the flow 112 are captured by the filter 132 before the flow 112 exits the outlet chamber 104. Occasionally, the reservoir 116 will need emptying, which can be accomplished by opening the drain 126 or by removing (e.g., unthreading) the reservoir 116 from the housing 114 and emptying (e.g., dumping out) the stain from within the reservoir 116.

[0049] Exhaust from the vacuum generator 134, which includes both fluids (e.g., air, vapors, etc.) drawn out of the outlet chamber 104 and air provided by the compressor or pump, is received within and travels through the muffler 150. In some

embodiments, exhaust from the vacuum generator can also pass through a filter adapted to remove various harmful and/or volatile vapors so that these vapors are not exhausted to the atmosphere.

[0050] Optionally, a variable control device may be provided that allows adjustment to and control of the flow rate at which the apparatus 100 operates. Accordingly, an operator may access the variable control device to adjust the flow rate of the apparatus 100 during operation thereof. Additionally, or alternatively, the valve 146 can also be adapted to allow an operator to, at least minimally, control and adjust the flow rate of the apparatus 100 during operation.

[0051] FIGS. 3 and 4 illustrate another exemplary embodiment of an apparatus 200 embodying several aspects of the invention. As described below, the apparatus 200 can be used to either or both suction residual stain from a surface and/or apply stain to a surface while using a flow from the suctioning.

[0052] As shown in FIG. 3 and 4, the apparatus 200 includes an inlet chamber 202, an outlet chamber 204, and a reservoir 216 for trapping stain entrained in the flow through the apparatus 200. The outlet chamber 204 is adapted to be connected to a low pressure source 210. The source 210 has a pressure lower than the pressure within the outlet chamber 204 such that connection of the outlet chamber 204 to the source 210 establishes a flow (indicated by arrows 212, in FIG. 4) through the apparatus 200, into the inlet chamber 202 and out the outlet chamber 204.

[0053] The source of low pressure 210 used to establish the flow through the apparatus 200 includes a pump 234, although other low pressure sources can also be used. Preferably, the pump 234 enables the apparatus 200 to operate at a flow rate between about one cubic foot per minute and three cubic feet per minute. However, other embodiments can include operating the apparatus 200 at different flow rates suitable for other applications including industrial or commercial applications, small business applications, personal or residential applications, and/or multi-line applications. For example, one exemplary multi-line application includes a

plurality of hoses in communication with a common reservoir in which is collected the stain entrained in the flows suctioned through the hoses.

[0054] The apparatus 200 is preferably adapted such that the flow from the suctioning, which may include flammables and combustibles, does not pass through or over windings of the motor driving the pump 234. Further, the pump 234 is preferably driven by a totally enclosed fan cooled (TEFC) motor in compliance with NEC Article 501-8b provisions for potentially Class I, Division 2, environments. In combination, these features facilitate compliance with Article 501-8b provisions defined by the National Electric Code (NEC) for potentially Class I, Division 2, environments.

[0055] The pump 234 may also include an internal filtration system (e.g., a 5-micron internal filtration system) adapted to remove particulates (e.g., saw dust, etc.) from the flow through the pump 234.

[0056] In at least some embodiments, the pump 234 is operable with standard 115-volt household current. As shown in FIG. 3, the pump 234 includes an electrical cord 280 preferably sized for connecting with a standard wall outlet.

[0057] As shown in FIGS. 3 and 4, the pump 234 can be connected to the outlet chamber 204 as follows. A bushing 236 (e.g., a polypropylene 1.50-inch by 0.75-inch bushing, etc.) is threadedly engaged with both a threaded portion 238 of the housing 214 and with another bushing 240 (e.g., a brass 0.75-inch by 0.375-inch bushing, etc.). One end of an elbow 282 (e.g., a brass 0.125-inch NPT male by female ninety degree elbow, etc.) is threadedly engaged with the bushing 240. The other end of the elbow 282 is threadedly engaged with a nipple 284 (e.g., a brass 0.125-inch by 1.25-inch long nipple). The nipple 284, in turn, is installed into the vacuum side of the pump 234 via an adapter (not shown) (e.g., a brass threaded adapter to go from British Standard Pipe Thread (BSPT) to NPT. In this exemplary manner, the pump 234 can be connected to the outlet chamber 204.

[0058] As shown in FIG. 3, an adapter 286 (e.g., a brass threaded adapter to go from BSPT to NPT, etc.) is installed in the pressure side of the pump. One end of an elbow 288 (e.g., a brass 0.125-inch NPT male by female ninety degree elbow,

etc.) is threadedly engaged with the adapter 286. The other end of the elbow 288 is threadedly engaged with a pneumatic hose coupling 290 (e.g., a galvanized steel industrial pneumatic hose coupling 0.125-inch male threaded, etc.). The pump 234 may also include a safety or pressure relief valve (not shown) connected to an auxiliary port on the pressure side of the pump.

[0059] The pneumatic hose coupling 290 is adapted for connection to an air brush or other suitable stain applicator (not shown). When connected to the coupling 290, the air brush can receive air from the pressure side of the pump 234. That is, the pump 234 provides the pressure for operating the air brush to push and/or apply stain to a surface. In some embodiments, the air brush can be used to force stain back into cracks and joints to eliminate shrink lines formed, for example, when the stain on door panels dry and shrink exposing lines of unstained wood.

[0060] The air brush can include its own reservoir or source of stain from which stain is drawn out of and used by the air brush during operation. In some embodiments, stain collected within the reservoir 216 by the apparatus 200 is added (e.g., poured or drained, etc.) into the air brush reservoir. In this exemplary manner, residual stain collected within the reservoir 216 by the apparatus 200 can be recycled and reused.

OPERATION

[0061] In operation, the apparatus 200 shown in FIGS. 3 and 4 can be used as follows. The tip 208, 208' or 208" most suitable for removing residual stain from the particular surface feature or type is selected and installed in the tube fitting 270 at the hose end portion 262. To install the selected tip, the existing tip, if there is one, must first be removed from the tube fitting 270. The removed tip can be stored within one of the tip holders 272, 272', or 272".

[0062] When the pump's electric cord 280 is plugged into a wall outlet (e.g., a standard 115-volt outlet, etc.), the pump 234 can be activated by switching the on/off switch 292 to its on position. At which point, the vacuum side of the pump 234 draws fluid (e.g., air and vapors, etc.) out of the outlet chamber 204. This, in

turn, establishes a flow through the apparatus 200 and creates suction within the hose 206 in a direction from the tip 208 towards the inlet chamber 202.

[0063] The inlet 274 of the tip 208 can then be positioned proximate residual stain to be removed. The suction within the hose 206 causes the residual stain to be pulled into the tip inlet 274 and to flow through the hose 206. The flow including the stain entrained therein is discharged from the hose 206 into the inlet chamber 202.

[0064] As the flow 212 (FIG. 4) travels from the inlet chamber 202 to the outlet chamber 204, stain entrained in the flow is collected in the reservoir 216. Particulates within the flow 212 are captured by the filter 232 before the flow 212 exits the outlet chamber 204. In this manner, the particulates (e.g., saw dust, etc.) suctioned into the apparatus 200 are prevented from entering and possibly clogging or damaging the pump 234 and/or stain applicator (e.g., air brush, etc.) which may be connected to the pressure side of the pump 234.

[0065] Occasionally, the reservoir 216 will need emptying, which can be accomplished by opening the drain 226 or by removing (e.g., unthreading) the reservoir 216 from the housing 214 and emptying (e.g., dumping out) the stain from within the reservoir 216. When the drain 226 is used, the filter 232 prevents particulates from exiting through the drain 226 thus allowing the stain to be separated from the particulates.

[0066] In some embodiments, the pump 234 includes an internal filtration system for removing particulates (e.g., saw dust, etc.) from the flow through the pump 234.

[0067] The operation of the apparatus 200 can also include applying stain with a suitable stain applicator (e.g., air brush, etc.) connected to receive operating pressure from the pressure side of the pump 234.

[0068] Optionally, a variable control device may be provided that allows adjustment to and control of the flow rate at which the pump 234 and thus the apparatus 200 operates. Accordingly, an operator may access the variable control device to adjust the flow rate of the apparatus 200 during operation thereof.

[0069] In another form, the invention provides methods of removing stain from a surface to which a stain has been applied. In one embodiment, the method generally includes suctioning residual stain from a surface. Preferably, the suctioning occurs at a flow rate between about one cubic foot per minute and three cubic feet per minute. However, the suctioning can also occur at other flow rates including flow rates suitable for industrial or commercial applications, small business applications, personal or residential applications, and/or multi-line applications.

[0070] The suctioning preferably occurs relatively immediately after the stain has been applied to the surface while the residual stain is still in a generally liquid state.

[0071] The suctioning includes using a source of low pressure (e.g., pump, vacuum generator, etc.) to establish a flow through an apparatus, into an inlet of the apparatus and out an outlet of the apparatus. The method can also include attenuating sound.

[0072] The method can further include collecting the residual stain in a reservoir. The method can also include applying at least a portion of the stain collected in the reservoir to a surface. In some embodiments, the method also includes applying the stain to a surface by using a flow from the suctioning, for example, for operating an air brush or other suitable stain applicator. The method can also include filtering particulates, combustibles, and/or volatile vapors (e.g., with a charcoal filter, etc.) from the flow established by the suctioning.

[0073] Further, the suctioning can include positioning a first end portion of a hose connected to the inlet chamber adjacent residual stain to be removed. A tip may be disposed at the first end portion of the hose. In which case, the positioning of the first end portion includes positioning the tip adjacent the residual stain. The method can further include selecting a corresponding one of a plurality of tips and removably coupling the corresponding one of the tips to the first end portion of the hose.

[0074] In another form, the invention provides methods of staining a surface. In one embodiment, the method generally includes applying stain to a

surface; suctioning residual stain from the surface; and collecting the residual stain suctioned from the surface in a reservoir. The stain in the reservoir can be reused or recycled. For example, some embodiments include applying at least a portion of the collected stain to a surface by using a flow from the suctioning, for example, to operate an air brush or other suitable stain applicator.

[0075] Preferably, the suctioning occurs at a flow rate between about one cubic foot per minute and three cubic feet per minute. Again, however, this flow rate is only illustrative with other embodiments including suctioning at other flow rates suitable for applications such as industrial or commercial applications, small business applications, personal or residential applications, and/or multi-line applications.

[0076] The suctioning preferably occurs relatively immediately after the stain has been applied to the surface while the residual stain is in a generally liquid state.

[0077] The suctioning includes using a source of low pressure (e.g., pump, vacuum generator, etc.) to establish a flow through an apparatus, into an inlet of the apparatus and out an outlet of the apparatus. The method can also include attenuating sound. The method can further include filtering particulates, combustibles, and/or volatile vapors from the flow established by the suctioning.

[0078] Further, the suctioning can include positioning a first end portion of one or more hoses connected to the inlet chamber adjacent residual stain to be removed. A tip may be disposed at the first end portion of the hose. In which case, the positioning of the first end portion includes positioning the tip adjacent the residual stain. The method can further include selecting a corresponding one of a plurality of tips and removably coupling the corresponding one of the tips to the first end portion of the hose.

[0079] Accordingly, embodiments of the invention allow for efficient residual stain removal in less time and with reduced labor costs as compared to traditional staining methods in which a rag or cloth is used to wipe off residual stain. These embodiments are especially advantageous for less accessible areas, such as

grooves, cracks, joints, etc., from which removing residual stain with a rag or cloth is oftentimes difficult and time consuming. Additionally, embodiments also eliminate the need for rags and cloths and the costs associated with their purchase, replacement, cleaning and/or proper disposal.

[0080] Some embodiments can further include recycling and applying at least a portion of the stain collected in the reservoir to a surface, for example, by using a flow from the suctioning to provide operating pressure for an air brush or other suitable stain applicator. This recycling can even further reduce the costs associated with staining processes.

[0081] Embodiments of the invention have the versatility to be used in a wide range of applications including personal, residential, small business, industrial, commercial, and multi-line applications. Embodiments of the invention also include apparatus (e.g., 100 and/or 200) which can be adapted to be stationary, mobile, standing, or hanging from a support surface.

[0082] It is anticipated that embodiments of the invention will be used for applying stain to and/or removing residual stain from a wide range of materials (e.g., wood, plastic, fiberglass, other building materials, etc.) and a wide range of surface types and features (e.g., cracks, crevices, grooves, joints, furniture, crown molding, trim, baseboards, doors, walls, fireplaces, stairs, decks, docks, other generally flat surfaces, etc.). Accordingly, the present invention should not be limited to a specific surface material, type or feature.

[0083] The description of the invention is merely exemplary in nature and, thus, variations that do not depart from the gist of the invention are intended to be within the scope of the invention. Such variations are not to be regarded as a departure from the spirit and scope of the invention.